

**AMENDMENTS TO THE CLAIMS**

1. **(Currently amended)** A reconstituted cell-free translation system for generating a peptidomimetic product comprising:
  - (a) translation factors; and
  - (b) more than one elongator tRNA species charged with a non-naturally occurring amino acid or amino acid analog capable of translating exogenously ~~exogenously~~ added mRNA(s) mRNA species with highly selective incorporation at each codon to form a peptide product, or a the peptidomimetic product ~~when the system includes one or more of the tRNA species charged with a non-naturally-occurring amino acid or amino acid analog, wherein the~~ peptidomimetic product comprises a non-naturally occurring amino acid or amino acid analog, and wherein one or more of the codons is one of the 61 sense codons or one of the three termination codons.
2. **(Currently Amended)** The translation system of claim 1 for generating a peptide peptidomimetic product, which ~~preparation system~~ is substantially free of the translation factors EF-P, W, W2 or rescue.
3. **(Canceled)**
4. **(Currently Amended)** The translation system of claim 2 1 for generating a peptidomimetic product, which ~~preparation system~~ is substantially free of ~~the a~~ translation factors factor selected from the group consisting of EF-P, W, W2 ~~or~~ and rescue.
5. **(Currently amended)** The translation system of claim 2 1, wherein the amino acid analog is selected from the group consisting of  $\beta$ -cyanoalanine, canavanine, djenkolic acid, norleucine, 3-phosphoserine, homoserine, dihydroxyphenylalanine, 5-hydroxytryptophan, 1-methylhistidine, 3-methylhistidine, allyl glycine (or its alkyne derivative counterpart), O-methyl-serine, biotinyl-lysine, biotinyl-cysteine (or other

biotin-labelled amino acids) cyclohexylalanine, homoglutamate, D-alanine (or other D-amino acids), N-methyl glycine (or other N-methyl amino acids); and epsilon-N-methyl-lysine, and radioisotope derivatives of the 21 natural amino acids or unnatural amino acids.

6. **(Currently Amended)** The translation system of claim 1, further comprising including one or more than one exogeneously added mRNA species encoding different peptidomimetic products.
  
7. **(Currently amended)** A cell-free translation system comprising translation factors and tRNA species capable of translating exogeneously exogenously added mRNA(s) mRNA species with highly selective incorporation at each codon to form a peptidomimetic product, which preparation system
  - (a) lacks one or more than one active wild-type elongator amino acyl tRNAs tRNA species and lacks the ability to synthesize said wild-type amino acyl tRNA species,
  - (b) includes at least more than one exogenous elongator amino acyl tRNA species charged with an a nonnatural amino acid species or amino acid analog, the exogenous elongator amino acyl tRNA species replacing said inactive wild-type elongator amino acyl tRNA species.
  
8. **(Currently Amended)** The A cell-free translation system of claim 7, including comprising translation factors and tRNA species capable of translating exogeneously added mRNAs to form a peptidomimetic product, which system
  - (a) lacks one or more active wild-type amino acyl tRNA species and lacks the ability to synthesize said wild-type amino acyl tRNA species,
  - (b) includes at least one exogenous amino acyl tRNA species charged with a nonnatural amino acid species or amino acid analog, the exogenous amino acyl tRNA species replacing said inactive wild-type amino acyl tRNA species, and
  - (c) comprises a plurality of different mRNA species encoding a plurality of peptidomimetic products.

9. **(Currently amended)** A kit for translating exogenously added mRNA to form a peptidomimetic product, the kit comprising:
- (a) components of the translation system of claim 1, translation factors and more than one elongator tRNA species charged with a non-naturally occurring amino acid or amino acid analog capable of translating exogenously added mRNA species with highly selective incorporation at each codon to form a peptidomimetic product; and
  - (b) instructions associated there with for using the kit for translating exogenously added mRNA to form a peptidomimetic product.
10. **(Currently amended)** A kit for translating exogenously added mRNA to form a peptidomimetic product, the kit comprising:
- (a) components of the translation system of claim 7, which can be admixed to form the cell-free translation system capable of translating exogenously added RNA to form a peptidomimetic-a cell-free translation system comprising translation factors and tRNA species capable of translating exogenously added mRNA species to form a peptidomimetic product, which system
    - (i) lacks more than one active wild-type elongator amino acyl tRNA species and lacks the ability to synthesize said wild-type amino acyl tRNA species,
    - (ii) includes more than one exogenous elongator amino acyl tRNA species charged with a nonnatural amino acid species or amino acid analog, the exogenous elongator amino acid acyl tRNA species replacing said wild-type elongator amino acyl tRNA species; and
  - (b) comprises instructions associated there with for using the kit for translating exogenously added mRNA to form a peptidomimetic product.
11. **(Currently amended)** A method for generating a peptide or peptidomimetic product comprising:
- (a) providing a cell-free translation system of claim 1;
  - (ab) contacting the translation system of claim 1 with one or more exogenous exogenous mRNA species encoding peptidomimetic products; and
  - (b) allowing sufficient time for the exogenous mRNA species to be translated, and

~~(c) isolating and/or identifying peptide or peptidomimetic products of the translation system thereby generating the peptidomimetic product.~~

12. **(Canceled)**
13. **(Currently Amended)** The method of claim 11, wherein the method is carried out on a library of at least 100 different RNA mRNA species, ~~and peptide or peptidomimetic products are identified or isolated from the translation system based on catalytic or binding activity.~~
14. **(Currently Amended)** The method of claim 11, wherein the mRNA species are is generated by in vitro transcription in the translation system.
15. **(Currently Amended)** The method of claim 11, wherein the ~~peptide or~~ peptidomimetic products are formed as a covalent adduct of the exogenous mRNA by which said products are encoded.
16. **(Currently Amended)** The method of claim 11, wherein the translation system is contacted with a library of different exogenous mRNA species to generate a variegated population of ~~peptides or~~ peptidomimetics products of at least  $10^3$  different sequences.
17. **(Original)** The method of claim 16, wherein at least  $10^8$  different sequences are produced.
18. **(Canceled)**
19. **(Currently amended)** A method for generating a peptidomimetic comprising:  
    (a) ~~providing a cell-free translation system of claim 7;~~  
    (ba) contacting the translation system of claim 7 with one or more exogenous exogenous mRNA species encoding peptidomimetic products; and  
    (b) allowing sufficient time for the exogenous mRNA species to be translated, and  
    (e) ~~isolating and/or identifying peptide or peptidomimetic products of the translation~~

system thereby generating the peptidomimetic product.

20-22. (Canceled)

23. (New) The translation system of claim 1, wherein the translation factors are bacterial translation factors.
24. (New) The translation system of claim 7, wherein the translation factors are bacterial translation factors.
25. (New) The translation system of claim 1, comprising four or more tRNA species charged with a non-naturally occurring amino acid or amino acid analog.
26. (New) The translation system of claim 6, comprising four or more tRNA species charged with a non-naturally occurring amino acid or amino acid analog.
27. (New) The translation system of claim 1, wherein highly selective incorporation at each codon comprises at least 90% selective incorporation.
28. (New) The translation system of claim 1, wherein highly selective incorporation at each codon comprises at least 95% selective incorporation.
29. (New) The translation system of claim 1, wherein highly selective incorporation at each codon comprises at least 98% selective incorporation.
30. (New) The method of claim 13, wherein the peptidomimetic products are identified or isolated from the translation system based on catalytic or binding activity.
31. (New) The translation system of claim 7 comprising a plurality of different mRNA species.
32. (New) The translation system of claim 1, wherein the peptidomimetic product comprises

more than two unnatural amino acids or amino acid analogs.

33. (New) The translation system of claim 31, wherein the peptidomimetic product comprises five unnatural amino acids or amino acid analogs.
34. (New) The translation system of claim 7, wherein one or more of each codon is one of the 61 sense codons.
35. (New) The translation system of claim 7, wherein one or more of each codon is one of the three termination codons.
36. (New) The method of claim 11, comprising contacting the translation system with more than one exogenous mRNA species.
37. (New) The method of claim 19, comprising contacting the translation system with more than one exogenous mRNA species.
38. (New) The method of claim 11, wherein the peptidomimetic products are identified, isolated, or both.
39. (New) The method of claim 19, wherein the peptidomimetic products are identified, isolated, or both.
40. (New) The translation system of claim 1, wherein the amino acyl tRNA species is synthesized from a tRNA species lacking a terminal CA dinucleotide.
41. (New) The translation system of claim 1, wherein the amino acyl tRNA species is synthesized from a tRNA species that is synthesized *in vitro*.
42. (New) The translation system of claim 1, wherein the peptidomimetic product comprises an unnatural backbone.

43. (New) The translation system of claim 1, further lacking the ability to synthesize at least one wild-type amino acyl tRNA species.
44. (New) The translation system of claim 1, wherein the non-naturally occurring amino acid or the amino acid analog is synthesized by chemical modification of a natural amino acyl tRNA.
45. (New) A composition for forming a polymer, which composition comprising
- (i) a nucleic acid template;
  - (ii) four or more adaptor nucleic acid species which base pairs to the nucleic acid template, wherein each adaptor nucleic acid species is physically coupled to a non-naturally occurring monomer; and
  - (iii) a means for polymerizing the monomers into a polymer when the adaptor nucleic acid species are hybridized to the nucleic acid template.
46. (New) The composition of claim 45, wherein the adaptor nucleic acid species is a tRNA.
47. (New) The composition of claim 45, wherein the nucleic acid template is an mRNA.
48. (New) The composition of claim 45, wherein the means for polymerizing comprises a ribosome.
49. (New) The composition of claim 45, wherein the monomer comprises an amino acid analog or a non-naturally occurring amino acid.
50. (New) The composition of claim 45, wherein the polymer is a peptidomimetic product.
51. (New) The composition of claim 45, comprising a plurality of nucleic acid templates.